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SEASONAL KETONAEMIA IN A DAIRY HERD, WITHOUT CLINICAL SYMPTOMS

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Introductory Discussion

The association of certain forms of clinically recognisable post-parturient disorder in cows with relatively pronounced ketonaemia has long been recognised. Stinson (1929), for example, emphasised the well-marked ketosis characteristic of the so-called " post-parturient dyspepsia," most commonly developing about ten days after calving although often recognisable from a few days onwards and sometimes encountered many weeks later. Stinson, in reporting associated hypoglycaemia in some of his cases, suggested the term " Bovine Hypoglycaemic Ketosis " for the condition characterised by high ketones and low blood sugar, and responsive to therapeutic injections of glucose.

So definite is the association of the commoner post-parturient disorder with the appearance of acetone bodies in blood, urine and breath, that the word " acetonaemia " is often used by practitioners to denote the clinical condition—erroneously, as pointed out by Boddie (1935) in his discussion of ketosis in dairy cows. " Acetonaemia " merely means " increase of blood acetone above the normal " and it is unjustifiable to use the word to denote a " clinical condition " in which increase of blood ketones is merely one symptom, arising from disturbance of the final stages of normal oxidation of fatty acids in the body. The word " ketosis " does of course signify a " condition associated with ketonaemia " but does not necessarily mean that any other observed clinical symptoms are causally related to the high level of blood ketones. There seems to be little evidence that ketone bodies, even at ten times the normal level, are toxic in themselves.

In connection with the use of the word " acetonaemia " it should also be remembered that it is itself a misnomer in the sense that the analytical methods commonly used include hydroxybutyric acid as well as acetone and aceto-acetic acid, *i.e.*, determine so-called " total ketone bodies." Much the greater proportion of the total in blood is always hydroxybutyric acid, both in health and disease.

The use of the word " normal " in relation to bovine ketonaemia has also to be considered. In some quarters there has been a tendency to consider any values derived from animals which appear to be clinically healthy as " normal " but this is obviously misleading. An assessment of " normal values " is best made in terms of a frequency curve in which a large number of apparently normal animals are considered on a succession of occasions throughout the year to rule out temporary disturbing factors. When this is done it is found that the normal value for the bovine is very similar to that of other mammals, *i.e.* " up to a few mg. p.c." (milligrammes per 100 c.c.) and that the value for the dairy cow generally falls below 5 mg. per cent.

Nevertheless values 100 or 200 per cent. above this (*i.e.* 10 to 15 mg.) frequently appear in cows in apparently perfect health and the fact that the rise is a genuine deviation from the normal can usually be shown by examining the blood at intervals a few months apart and observing return to the expected 2 or 3 mg. per cent. One cannot avoid referring to such high values as " above the normal," the dictionary word for which is " ketonaemia." When to call ketonaemia slight or mild and when to call it " pronounced," is a matter of arbitrary choice ; in general it is reasonable to refer to anything below 5 mg. per cent. as normal, anything from 5 mg. per cent. to 15 mg. per cent. as mild, and anything beyond that as pronounced.

Most of the records in the literature deal with ketone values in animals either known to be quite normal or showing a clinical condition suspected to be associated with definite ketonaemia, *e.g.* Sjollema (1932), Sampson, Hayden and co-workers (1933), Boddie (1935), and Henderson (1938). Bullard (1939) reported that acetonaemia was much commoner in the dairy cow than generally believed and that only a proportion of acetonaemic cows actually showed clinical symptoms. Duncan, Huffman and Tobin (1939) discuss 37 references to literature, provide useful tabular summaries of previous data on ketone values in blood and urine, and show that ketonaemia and ketonuria are common in pregnant and lactating cows under conditions of stall feeding, incidence of clinical disorder being commonest in late winter and early spring months, and clearing up after turning out to pasture.

Over the last few years the Veterinary Laboratory at Weybridge has acquired a large volume of data, mainly in collaboration with A. Messervy and E. Messervy in the island of Jersey, on the definite clinical condition, generally responsive to glucose injections. This will be reported upon at a later date, the purpose of the present paper being merely to record data accumulated in 1937-1938 on the normal dairy herd of the National Institute for Research in Dairying at Reading, which show the wide variations

in blood ketones which can occur in dairy cows without hypoglycaemia and without association with clinical symptoms at all. But for the incidental analytical study no ketonaemia would have been suspected, and the cases therefore form a useful adjunct to the observations of Bullard who noted a proportion of acetonaemic cows without clinical disorder and to those of Duncan, Huffman and Tobin in which the incidence of recognisable disorder was very high.

Experimental

About 60 cows were available for observation, and blood samplings were made in late June and early July of 1937 at grass, in late February and early March of 1938 in stalls and again in July 1938 at grass. With a few exceptions three samples were thus obtained from each cow, as shown in Table I, which records "carbon dioxide combining capacity" (alkaline reserve), glucose, and total ketones. Calcium and magnesium were also determined in the serum but since all values fell within the normal range, with no consistent variations between winter and summer, the actual figures are omitted from the table.

In the summer of 1937 total ketone bodies were determined on the serum by the gravimetric method of van Slyke but in no case was the magnitude of precipitate worth the labour of filtration and weighing and the letter T in the table therefore represents "normal traces," certainly below 5 mg. per cent. During the winter of 1937 a very sensitive rapid colorimetric micro-method was adopted, applying the condensation reaction between acetone and alcoholic salicyl aldehyde to small volumes of distillate and reading extinction coefficient of colour development with a Zeiss photometer. Precise data, even at levels below 2 mg. per cent., are therefore given for the two 1938 samplings.

Sugar was determined by the method of Hagedorn and Jensen on whole blood collected into a mixture of potassium oxalate and sodium fluoride, and "carbon dioxide combining capacity" by the van Slyke manometric method on plasma centrifuged from the same blood within a few hours of collection.

From the data of Table I it will be noted that the ketone values of the cows at grass in the summer of 1937 were all "below 5 mg. p.c." The more precise determinations in July 1938, of the same herd under the same conditions, gave an average of 3 mg. per cent. with a range of 1·6 mg. per cent. to 7 mg. per cent., only one animal, however, reaching the higher figure. Of the 51 samples examined only four cows showed values above 5 mg. per cent. while six were below 2 mg. per cent., thus confirming the view that the "normal value" can be taken as "a few mg. p.c., rarely exceeding 5 mg. p.c."

During the months of February and March 1938, when the cows were in stalls with heavy supplementary feeding on concentrates balanced according to milk yield expected, there was a general increase in blood ketones, the average of 59 animals being 8·1 mg. per cent. or nearly three times the summer average. Of these, 18 (30 per cent.) had values still below 5 mg. per cent., 30 (50 per cent.) had values between 5 mg. per cent. and 10 mg. per cent., 7 (12 per cent.) values between 10 mg. per cent. and 15 mg. per cent., while 4 values (7 per cent.) exceeded 15 mg. per cent. One reached the high figure of 45 mg. per cent. Thus 70 per cent. of the individuals in the herd considerably exceeded their own summer values, while the 12 per cent. showing values between 10 mg. per cent. and 15 mg. per cent. can certainly be classified as distinct or "mild" ketonaemia, and the 7 per cent. above 15 mg. per cent. as "pronounced."

Reference to the figures for blood sugar and "carbon dioxide combining capacity," indicate neither hypoglycaemia nor acidosis in the sense of lowered alkaline reserve.

Although the mean sugar level was lowest in the late winter period it is very little lower than the mean of the two summer values. The three lowest values of 47 mg. per cent. for cows 28, 60 and 135, in March 1938, cannot be classified as hypoglycaemia and in the case of cow 135, the summer values, 50 mg. per cent. in 1937 and 57 mg. per cent. in 1938, are not much higher.

The majority of plasma bicarbonate values lay between 60 and 70 v. per cent. CO_2, both summer and winter, and any slight difference in average values happens to be in favour of winter. One animal, No. 58, showed the relatively low value of 40 v. per cent. in the summer of 1937 as against 80 v. per cent. in the winter of 1938 but no explanation is offered for this except undue excitement and overbreathing on rounding up from pasture for bleeding. There is certainly no general relationship between ketones and alkaline reserve in these cases. Thus cow 113 with the very high value of 45 mg. per cent. total ketones showed the normal carbon dioxide combining capacity of 62 v. per cent., actually slightly higher than her value 57 v. per cent. when the ketone value was down to 3·5 mg. per cent. a few months later.

Despite the generally higher blood ketone values during the winter period, the considerable proportion showing "mild acetonaemia" and the lesser proportion showing "pronounced acetonaemia," no clinical symptoms whatever were shown. The most that could be suspected even of cow 113, with the high level of 45 mg. per cent. about two months after calving, was occasional slight inappetence and small diminution of milk yield.

During the following winter a proportion of the cows in the same herd came under observation in another connection and there was some evidence that a tendency to "ketonaemia without clinical symptoms" was an individual characteristic. Cow 113, for instance, showed 30 mg. per cent. total ketones in March 1939 as against her summer value of 3·5 mg. per cent. but previous winter value of 45 mg. per cent. This high value was maintained over weeks and probably months.

Correlation of blood ketone levels and milk production gave no very definite picture beyond a general tendency towards higher values with increasing consumption of concentrates allowed for milk production. Many of the best milkers, however, showed comparatively normal ketone values.

An attempt was also made to correlate blood ketone values with period of lactation, but beyond a general tendency for higher values within the first ten weeks after parturition there was no clear relationship. Some of the cows showed normal values well within this period.

In view of the relationship between disturbance of fat metabolism and ketone production a few observations were made, in collaboration with Dr. S. Bartlett,

TABLE I

N.I.R.D. DAIRY HERD: BLOOD DATA.

No.	July, 1937.			March, 1938.			July, 1938.		
	CO_2 combining capacity plasma v. per cent.	Sugar blood mg. per cent.	Total ketones serum mg. per cent.	CO_2 combining capacity plasma v. per cent.	Sugar blood mg. per cent.	Total ketones serum mg. per cent.	CO_2 combining capacity plasma v. per cent.	Sugar blood mg. per cent.	Total ketones serum mg. per cent.
1	65	55	T	77	55	4·1	67	65	1·6
2	61	66	T	72	49	4·8	—	—	—
9	61	68	T	65	57	7·0	77	60	2·7
11	66	53	T	68	55	14·4	65	56	1·6
13	64	61	T	63	56	8·3	74	67	3·3
16	64	64	T	64	64	5·9	—	—	—
21	—	—	—	63	55	9·1	59	54	2·4
24	75	58	T	67	57	8·4	59	58	5·0
28	56	64	T	67	47	8·2	68	62	7·0
29	65	67	T	75	67	7·3	73	64	2·8
33	57	60	T	68	57	4·9	77	61	1·8
36	54	59	T	69	54	14·0	67	56	2·3
41	68	57	T	65	51	6·9	65	57	3·8
42	63	64	T	73	58	8·6	65	57	2·4
44	50	73	T	64	61	4·5	—	—	—
50	61	60	T	74	52	15·4	61	56	2·1
56	63	65	T	70	60	7·2	69	63	3·9
58	40	57	T	80	54	7·5	—	—	—
60	70	53	T	68	47	6·3	72	64	3·0
62	66	62	T	61	60	7·6	71	53	6·5
64	62	64	T	58	55	6·2	74	65	5·1
66	60	63	T	70	49	7·6	63	72	2·4
67	64	66	T	63	48	21·5	72	57	4·6
68	57	55	T	78	57	10·6	71	57	3·3
102	52	62	T	56	54	11·8	51	59	2·3
104	63	54	T	63	52	5·9	60	57	4·0
111	61	55	T	65	58	7·6	64	59	4·1
112	64	79	T	58	62	4·5	73	57	3·7
113	67	58	T	62	49	45·0	57	54	3·5
114	65	55	T	68	57	3·8	57	57	3·8
115	70	60	T	69	50	3·6	65	63	2·2
116	64	55	T	72	57	3·7	65	58	2·8
117	63	71	T	68	52	4·0	—	—	—
118	63	51	T	70	58	4·6	68	59	2·4
119	62	52	T	71	60	8·1	78	57	2·4
120	69	54	T	65	55	7·2	73	58	2·4
123	64	49	T	72	58	6·1	58	60	2·6
124	64	64	T	69	56	3·7	—	—	—
126	68	57	T	77	60	4·6	73	53	1·9
127	53	65	T	63	53	16·6	69	56	2·7
129	—	—	—	69	50	6·6	76	57	1·6
130	63	58	T	63	52	3·7	72	57	2·3
131	66	56	T	63	53	6·1	68	58	2·9
133	67	64	T	64	58	8·0	62	57	2·8
134	66	54	T	74	51	11·6	74	59	1·9
135	60	50	T	64	47	12·0	69	57	2·4
137	63	61	T	73	49	4·2	72	57	2·6
138	72	56	T	78	49	4·1	—	—	—
142	—	—	—	73	53	7·2	71	65	3·4
143	78	61	T	74	54	8·0	—	—	—
144	65	57	T	67	51	3·6	66	61	2·8
145	—	—	—	70	69	9·1	64	58	2·7
147	—	—	—	63	57	8·6	66	57	2·4
148	—	—	—	66	58	6·8	60	62	2·5
149	—	—	—	74	56	4·7	67	54	2·9
150	—	—	—	75	52	6·7	70	55	2·3
151	—	—	—	72	50	8·3	68	60	2·6
162	—	—	—	71	62	4·2	64	64	2·3
164	—	—	—	75	60	11·2	65	62	4·2
Mean	63	60	T	68·5	55	8·1	67	60	3·0
Range	40-75	49-79	—	56-80	47-69	3·6-45·0	51-78	53-72	1·6-7·0

T denotes " normal traces," *i.e.*, less than 5 mg. per cent.

on the same herd in 1938-1939, in which additional fat was supplied in the ration by equicaloric substitution of ½ lb. of linseed oil in the ration of one group of five cows and of ½ lb. of butter fat in another. This seemed to have no significant specific effect on the level of blood ketones although the general elevation of winter values was again noted in the herd as a whole.

SUMMARY

(1) Comparative determinations of total serum ketones, blood sugar, and alkaline reserve of plasma were made on a dairy herd of 59 cows, at grass in the summer of 1937, in stalls in late winter of 1937-1938, and again at grass in summer 1938.

(2) Wide variations in ketone values were observed, indicating a definite rise under stall conditions in 70 per cent. of the herd, without, however, any manifestations of clinical symptoms. In 1938 the average winter value was 8·1 mg. per cent. or nearly three times the corresponding summer average of 3 mg. per cent., with 70 per cent. of the values over 5 mg. per cent., 30 per cent. between 5 mg. per cent. and 10 mg. per cent., 12 per cent. between 10 mg. per cent. and 15 mg. per cent., and 7 per cent. over 15 mg. per cent. One cow reached 45 mg. per cent. but beyond a probable slight inappetence and diminution of milk yield showed no sign of ill-health.

(3) The observed ketonaemia was not associated with hypoglycaemia, blood sugar values being normal throughout, in distinction to the hypoglycaemia commonly associated with clinical conditions in which ketosis is a prominent feature.

(4) No acidosis was associated with the observed ketonaemia, plasma bicarbonate remaining unaffected and lying within the normal range both winter and summer.

(5) Correlation of blood ketones with period of lactation and quantity of concentrates allowed for milk production was not pronounced but was sufficient to suggest that high yielding cows were more susceptible to ketonaemia although individuality played the greater rôle.

(6) Although the mere presence of blood ketones above the normal suggests difficulty in the final stages of oxidation of fatty acids in the body, the equicaloric substitution of ½ lb. of butter fat or linseed oil in the ration did not accentuate observed mild ketonaemia.

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Arthritis in Army Animals as a Cause of Permanent Disability*

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Statistics furnished by reports to the office of The Surgeon General of the Army provide much for thought on the subject of arthritis, particularly with regard to the relationship of arthritis and the disability incident thereto. These statistics furnish a most comprehensive compilation, inasmuch as they show the incidence of the particular disease or condition among a definite number of animals owned by the Army and located in all parts of the continental United States as well as in some of the outlying possessions.

It may be well to define briefly some of the aspects of this subject. Arthritis is a well-known term, denoting an inflammation of a joint. The etiology of arthritis will not be included in the definition inasmuch as causative factors other than direct injury or penetration of a joint apparently exist.

Permanent disability as applied to an army animal, refers to a disability which is continuous and severe enough to be a serious impediment to the animal in performing the type of work required of it. The work of an army animal is unusual in that it must be performed at all of the various gaits. Thus many animals may exhibit permanent disability because of this requirement whereas under other conditions they might perform work satisfactorily. For instance, it is known that it is possible for an animal to withstand easily ordinary farm work and yet be incapacitated for service in the Army.

The accompanying chart gives the statistics on the mean animal strength and the incidence of arthritis and allied conditions in army animals during the years from 1935 to 1938 inclusive, as compiled from the animal reports of The Surgeon General. It will be noted that arthritis is a leading cause of disability in this group of diseases, and that the number of animals which have died or have been destroyed is represented by a comparatively high percentage. This tends to show that the treatment of such animals has not been fruitful to the extent that control of the condition can be considered adequate in so far as maintaining an active status of an animal in the Army service is concerned.

Arthritis, and the other conditions listed, all have the characterstic of being chronic with more or less progressive irregularities. Treatment has been designed to relieve symptoms, to halt the progress of these conditions, and to assist the tissues in their natural regenerative processes, but without any concerted effort at removal of the cause. Due to the nature of these conditions, it is also a known fact that included in the number of animals affected and still retained in the service, there will be a number of victims of the progressive tendencies of these conditions within a period of 1 to 5 years.

It may be said that the group of conditions listed in the chart represents considerable overlapping. In the instance of ankylosis, for example, an arthritic condition is almost bound to have existed prior to the onset of ankylosis. In like manner, in the absence of adequate means to make a diagnosis, a fracture might erroneously

*Monograph prepared at Army Veterinary School, Basic Officers' Course 1939-40. Reproduced from the *Veterinary Bulletin* (Supplement to the *Army Medical Bulletin*) for the Veterinary Corps, Medical Department, United States Army, April, 1940. **34.** 134-146.

Mean Animal Strength.	1935				1936				1937				1938			
	18,684 Horses		8,136 Mules		17,123 Horses		6,894 Mules		15,994 Horses		4,041 Mules		17,126 Horses		3,516 Mules	
	Admissions		*Deaths*		*Admissions*		*Deaths*		*Admissions*		*Deaths*		*Admissions*		*Deaths*	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
Arthritis	322	76	101	27	268	73	108	27	277	32	116	7	222	24	88	7
Arth. Ch. Def. Tarsi.	108	52	32	24	107	30	46	8	101	27	53	16	82	6	27	5
Osteomalacia ...	15	14	8	2	81	137	29	32	5	1	0	0	1	2	1	2
Ankylosis... ...	5	1	4	1	5	1	5	1	7	0	6	0	1	1	2	1
Ossification of Lat. Cart.	231	79	75	19	203	56	44	13	183	23	80	9	219	29	76	9
Fracture	171	21	95	15	157	19	99	14	154	13	114	8	153	11	94	8
Ringbone... ...	258	39	106	16	244	46	90	14	256	23	112	11	233	10	104	9
Sesamoiditis ...	31	5	4	0	30	0	1	0	11	0	2	0	46	0	13	0

be called arthritis, although in fact any fracture involving a joint is an active cause for arthritis. Ringbone often involves the pastern joint, causing severe arthritis. Sesamoiditis may involve the fetlock joint. The writer knows of a case which had been repeatedly carded for sesamoiditis, but which on subsequent examination was found to be a case of original fracture of the sesamoid bone with subsequent callus formation that protruded upwards into the structure of the suspensory ligament.

It is not necessary, however, to become greatly involved by the overlapping of the several conditions, as a general picture is of more particular value. Several interesting observations may be made from the above chart. During 1938, the death rate, which includes animals destroyed because of disability, was somewhat lower in comparison with the number of admissions for arthritis, arthritis chronica deformans tarsi, and ossification of the lateral cartilages. The simultaneous lowering of the death rate from these three causes is significant when one bears in mind the emphasis placed upon minerals, vitamins, and nutritional factors in recent years. It suggests the possibility of a background in which professional knowledge is gaining ground.

Another general observation is that several distinctly different causes may be represented in a condition like arthritis. For instance, arthritis may be the sequel of a traumatism, or it may be the result of a nutritional deficiency. Present-day thought concerning the etiology of chronic deforming arthritis of the tarsus and ossification of the lateral cartilages indicates that there are perhaps several very different factors which produce similar results. Perhaps etiological factors have not been undeniably established.

For convenience in the further pursuance of this subject the outline of Regional Veterinary Surgery and Operative Technique, by John A. W. Dollar, will be used in part. In the consideration of other conditions, the writer will cite his source of information as such conditions are presented.

Affections of Joints

Contusions.—Contusions are the result of direct trauma to the region of the joint without a rupture of the membrane. While the great majority of these cases will recover uneventfully, the prognosis is generally guarded as permanent lameness is possible, due to irreparable damage to the articular structures and possible ankylosis.

Sprains.—Sprains, like contusions, do not often result seriously but in a few cases they do. The condition, therefore, may be a potential contributory factor to permanent lameness.

Dislocations.—These seldom occur in army horses, and the factors involved as far as permanent lameness is concerned would be the possibility of replacement, retention, and the extent of damage to articular structures.

Open Joint.—Open joint is either the result of direct incision or laceration of a joint capsule or of rupture due to distention of the joint cavity by pus. In the latter case, a wound in the vicinity of the joint is usually a predisposing factor to the subsequent infection of the joint. These cases have a high degree of mortality or result usually in permanent lameness.

Traumatic Arthritis.—According to Dollar's Veterinary Surgery, traumatic arthritis is considered the result of septic infection through an open penetrating wound of a joint. This condition is well known to all veterinarians by its usual fatal termination. It is reasonably certain that any animal afflicted with this condition will eventually be a total loss.

Closed Synovitis.—Closed articular synovitis, according to Dollar's Veterinary Surgery, is inflammation of a joint occurring apart from an open joint. Acute inflammation is manifested by the heat, pain, and swelling of the area around the joint. The joint capsule is severely distended due to the excess of synovia. This condition may accompany bacterial infections by virtue of the toxins circulated in the blood stream, and accounts for the condition of closed synovitis seen in cases of strangles and pneumonia.

The progress of the disease usually determines the outcome of the synovitis involved. Where it occurs as an independent condition, the outcome may terminate favourably or persist in a chonic form with varying degrees of disability.

All conditions considered thus far have their bearing more or less directly upon accidents of one kind or another, except possibly the case of closed synovitis occurring simultaneously with specific diseases like strangles or pneumonia. Here it may be considered as a complication, and disappearance of the condition with recovery of the animal renders it unimportant in so far as this paper is concerned.

The various conditions with an arthritic involvement about to be considered are those which cannot be entirely ascribed to trauma. The etiology of these conditions has received considerable attention in recent years and, in general, the evidence tends to indicate a nutritional deficiency or other systemic disorder as involved factors.

Articular Rheumatism

Articular rheumatism is considered as a rare occurrence among horses by Dollar's Veterinary Surgery. This text briefly describes the characterisation of the disease as featured by febrile disturbance, affection of several joints at once, shifting of the inflammation from one joint to another, and sudden improvement followed by relapses.

A report by Lt.-Colonel J. R. Hodgkins in *The Veterinary Journal*, London, of an autopsy of a single case in a 4½-year-old horse, diagnosed as equine articular rheumatism, reveals certain points of interest. The salient points brought out in this *post-mortem* are quoted:—

"*Stifles.*—The tissue surrounding the joint was infiltrated and yellow. The synovia was very plentiful and of a deep yellow colour. The cartilage of the distal ends of the femurs was of a pinkish colour and, over a large area, was ridged (corrugated) and was evidently in process of degeneration preceding erosion.

"*The Patellae.*—Showed opaque areas and the substance of the cartilage was tufted (fluffy) in spots.

"*The Tibiae.*—The proximal ends of the tibiae had definite well-formed ulcerations (scarlet edges and yellow centres).

"*The Hocks.*—Were bulging and the synovial content of a deep yellow colour. On boiling out, the bones showed exostoses, particularly the os calcis and astragalus.

"*The Fetlocks.*—The sesamoid bones were particularly affected by an ostitis and a new bony growth.

"Material was taken under the usual precautions from mesenteric glands, heart, liver, and the joints.

"Microscopical and bacteriological reports were negative. This is in accordance with the view that 'the micro-organisms present in some other part of the body do not invade the joints and adjacent tissues but the inflammatory process represents an anaphylactic reaction to the influence of toxin upon these parts.' (Hutyra and Marek, 1938. Vol. III, page 480.)

"The primary focus, however, was obscure in this case, for careful search failed to reveal it."

Equine Degenerative Arthritis

It has been interesting to the writer to note the points of similarity of articular rheumatism in the preceding topic with the excellent work of R. A. Kelser, Colonel, V.C., and G. R. Callender, Colonel, M.C., on equine degenerative arthritis, as reported in *Veterinary Medicine*, July, 1938. In giving consideration to this presentation, a comprehensive list of references has been given.

It may not be too presumptive to say that when articular rheumatism is mentioned, in reality the condition is synonymous with equine degenerative arthritis. The report represents some of the most comprehensive investigation published on this subject to date.

The importance of this condition as a cause of disability in army animals is, no doubt, very definite. Several factors make a definite conclusion as to the prevalence of this condition very difficult. In the past, diagnosis has probably been influenced by two distinct phases of the same disease. Articular rheumatism is a diagnostic term based primarily on symptomology, whereas it is conceivable that the latter stages of this disease may have been diagnosed definitely as arthritis. Conclusions can be only an estimate of the present occurrence of equine degenerative arthritis if the foregoing statement has any application. The conclusions as stated in the article are quoted herewith.

"A large percentage of army horses and mules in Panama have been found to have degenerative arthritis involving principally the leg joints and causing varying degrees of lameness.

"The condition is not a phase of, nor associated with, osteomalacia as was originally supposed.

"The primary cause of this degenerative arthritis has not been determined. It is apparently not of bacterial origin. Further, it is not inflammatory in character.

"The pathological changes suggest that the condition is a deficiency disease in which a disturbance occurs in the nutrition of the articular cartilages without necessarily involving other tissues. Further studies will be required to clear up this phase of the subject and to determine whether or not mineral deficiency, an imbalance of minerals, a shortage of certain vitamins, or a combination of these factors, are of etiological significance.

"A marked similarity exists between the joint disease we have studied in equidae and human degenerative arthritis. Comparative studies have been made of the condition in the two species and will be the subject of a separate report."

Osteomalacia

Osteomalacia has been rather definitely established as a deficiency disease in which decalcification of previously calcified tissues occurs in the presence of a ration high in phosphorus. This disease has no direct bearing on the subject of arthritis as a cause of permanent disability, but bones are rendered more susceptible to fracture, and joints are quite likely to be involved to some degree in a generalised condition of bone pathology.

Spavin and Ringbone

The consideration of these conditions is made together because apparently they often have their beginning in the proximity of a joint and subsequently involve it. These conditions, as may be noted in the chart previously presented, figure prominently in the disability of army animals. Etiology has been ascribed to traumatic influences as exciting causes combined with certain predisposing causes such as heredity, defective conformation, etc. However, it is probable that these causes may be questioned. Dollar in his Veterinary Surgery claims that in spavin hereditary predisposition is a proved fact. Nutritional factors have gained considerable attention.

Treatments in these conditions have given variable success in halting the inflammatory process and restoring an affected animal to usefulness after a period of rest. The treatment in substance only enhances the blood

supply to the region by inducing an active inflammation, but the rest following the treatment is generally conceded to be a required adjunct. Such animals are often turned out to pasture. In this regard the course of treatment has given a definite place to rest and perhaps to nutrition. In a discussion of "Skeletal Diseases of the Horse," H. C. Crawford is quoted in two instances as follows:—

"It has been known for some time that when a horse shows clinical evidence of one of the spavin group of lamenesses, the condition is due to some hereditary predisposition or a skeletal diathesis. It has been definitely shown, however, that such hereditary traits can be eradicated through the proper allotment of minerals. In one instance, an entire stud whose foals were thus affected was moved to a mineral-efficient location, with the result that all of the foals born in this new location were free of such defects.

"Relative to the application of firing as an intervention to correct osteoarthritis, the practitioner is confronted by the limited response to such treatment for an ostitis systemic in character (carpitis, tarsitis, sesamoiditis) as compared to one local in type.

"Systemic ostitis only rarely responds to firing, but an osteoperiostitis of a local type may respond within certain limits, *i.e.*, reduction in size of exostoses as well as checking the productive process."

Inco-ordination of Equidae—Wobblers

As described by W. W. Dimock, D.V.M., and B. J. Errington, D.V.M., PH.D., in their report on this subject in the *Journal of the Army Veterinary Medical Association*, September, 1939, this equine disease has been found in sucklings, weanlings, yearlings and, occasionally, in 2-year-old animals, with the majority of cases in the yearlings. The conclusions as they appear in the report are quoted:—

"The constriction of the cervical spinal canal and foramen, the spondylarthritis, the degenerative changes in the spinal cord and in the spinal nerves, which have been found in equine wobblers, warrant consideration as significant factors. The correlation between them and their relative importance to the disease is uncertain. Some hope lies in a chemical analysis of the bone, a further histopathological study of the bones, nerves and cord, a correlation of these with the clinical picture, and a more thorough knowledge of the nutritional requirements of Equidae."

Navicular Disease

According to Dollar's Veterinary Surgery, navicular disease is due to a chronic ostitis of the navicular bone, associated usually with chronic synovitis of the navicular bursa and inflammation of the plantar aponeurosis.

This condition is a factor in the disability of army animals. While the exciting cause or causes are obscure, it is interesting to note certain facts. It is known to occur when a horse is at his prime, which is about 7 years of age. Animals afflicted at an earlier age are not uncommon. Both feet are usually involved, as stated by Dollar, and the disease is usually progressive in character. Hind feet have been known to be affected.

As a matter of comparison, navicular disease usually affects the front limbs as is also true of ringbone and ossification of the lateral cartilages. All of these conditions are progressive in character. The most notable change in navicular disease is the presence of ulcers on the posterior surface of the navicular bone, lesions which are similar to those occurring in joint surfaces in equine degenerative arthritis previously mentioned in this report.

Kelser and Callender,[4] in their report on equine degenerative arthritis, make the following statements:—

"During the last several years, Mitchell of the Royal (Dick) Veterinary College of Edinburgh, Scotland, has published several articles on what he has called 'rheumatic disease.' He includes under this term not only the osteo-arthritic conditions such as spavin, ringbone, sidebone, splint, navicular disease and arthritis, but also 'roaring,' 'shivering,' 'stringhalt,' partial paraplegia, etc. He states that his 'contention is that all these conditions are merely local manifestations of one general disease, and as I know of no comprehensive name which would include them all, I have suggested that the term rheumatic disease be applied to them, though I have expressed the hope that in the not-too-far distant future, this term will disappear and the disease be named more in accord with its true cause.' Aside from making his group more extensive, Mitchell is in agreement with the previously published views of Williams, *et. al.*, as to these conditions being manifestations of a single disease."

Nutrition in its Relation to Arthritis and Allied Conditions

Members of the veterinary profession will welcome the time when the chapter on such a topic can be offered and adequately substantiated. As it is, all that can be offered are the following remarks and quotations:—

First, one of the conclusions in the report of Kelser and Callender[4] on equine degenerative arthritis is: "'The pathological changes suggest that the condition is a deficiency disease in which a disturbance occurs in the nutrition of the articular cartilages without necessarily involving other tissues. Further studies will be required to clear up this phase of the subject and to determine whether or not mineral deficiency, an imbalance of minerals, a shortage of certain vitamins, or a combination of these factors are of etiological significance."

Second, Dimock and Errington,[6] in their discussion on Wobblers, say: "Some hope lies in a chemical analysis of the bones, nerves and cord, a correlation of these with the clinical picture, and a more thorough knowledge of the nutritional requirements of Equidae."

Third, Dudley, in his article on "Some Practical Thoughts on Nutrition," says: "Soil depletion has very materially affected the mineral content of feeds grown on such land. Dr. E. V. McCarthy, of Chicago, has said: 'The most common source of error in reference to dietetic requirements of animal life lies in the mineral content of food. This is the most inconsistent factor of all and is more often than not completely lost sight of in feeding. As an example, authoritative investigation has shown that certain vegetation grown under conditions in one section of the country assays 178·5 parts per million of iodine, as against 19·5 parts from another section. Another comparison is 160 parts per million of iron as against 70·5 parts per million.

"'It is customary for medical advisors to have in mind the mineral requirement of the body and to advise foods of high mineral value in outlining diets, completely overlooking the fact that many of these foods as now marketed may be totally devoid of their expected mineral content.'"

Fourth, Dr. Hunt states, further: "Mr. Dan Braum, Drs. Hughes and Hall, the latter two of the Chemistry Department, Kansas State College, became interested. From their unpublished work of several years, it would appear that the following conclusions are in order:—

"'First, there is a definite ratio of calcium to phosphorus in the animal body and that is influenced by the feed,

"'Second, additions beyond this ratio of either calcium or phosphorus will create a deficiency of the one not added.

"'Third, any recommendations as far as mineral suplements are concerned must be in accordance with conditions existing in the soil as far as these two elements are concerned.'"

Continuous cropping is known to deplete soils. It is evidenced further by certain practices as, for example, the practice of applying lime to land in recognition of the calcium requirement of alfalfa. What about our upland prairie grasses? Where nature used the excess dead vegetation from year to year as a natural replenishing agent, it is now common practice to remove all that excess vegetation in the form of hay.

What is really the difference in such hay now, in its mineral content, as compared to 40 years ago? Combine any real effect upon such soil with the effects of drouth or excessive moisture upon the root system of a plant, and what will be the actual analysis of the harvest?

Conclusion

Arthritis as a cause of permanent disability, is a very real factor and one which calls for every possible effort to reduce injuries to a minimum. The hoped-for enlightenment of the nutritional phases of animal feeding, together with definite knowledge of physiological functioning and individual idiosyncrasies, may contribute much to solve undetermined etiological factors which are not known at the present time. It may be that the effect of the publications of the past few years, some of which have been used in this paper, is making itself felt as evidenced by a trend toward a lowered incidence in admissions and disabilities or deaths due to improved rationing of animals.

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MEDICINAL HERB PRODUCTION ON FARMS

To guard against a shortage of essential drugs, the Ministry of Health recommends extended production of certain medicinal herbs in this country, and suggests that farmers and others wishing to engage in this cultivation should work in co-operation with commercial firms. If asked, the Ministry of Agriculture will advise on production and cropping.

Belladonna, digitalis, henbane and stramonium are the herbs needed. Generally they are imported from Jugoslavia, Hungary, Egypt, France, etc., where they very largely grow wild. Thus production costs have been negligible and we have been unable to compete in the production. Now these sources of supply have been cut off. Fortunately, this country has quite appreciable stocks. During the last war herb growing was extended here, but many firms have since closed down.

The present scheme proposes that selected farmers in suitable districts should put down a few acres to these herbs, the production of which, in some cases, has to be increased tenfold. Cultivation must be linked up with proper drying and collection and growers would have to make their own terms with commercial firms.

THE VETERINARY RECORD
October 12th, 1940.

FORWARD

From the President, N.V.M.A.

ON the recommendation of the Council, the members present at the Annual General Meeting have seen fit to re-elect me as President of the Association. Those who are in a position to appreciate the weight of responsibility and the degree of effort which acceptance of this office imposes upon the holder, will realise that it is with very mixed feelings that I have agreed to the proposition.

I understand that one of the reasons for my re-election is to enable me to complete some of the tasks which have been initiated during the past year. If this is so, then I should like to assure your readers that it will be my earnest endeavour to secure the full employment of every member of the profession in the national interest. I am certain that if our services were utilised as they should be there would be insufficient veterinary surgeons for the work. Our mission must be to educate, and co-operate with, the farmer—to ensure the maximum production of milk and meat; to reduce the waste due to avoidable disease and bad or indifferent animal husbandry.

Now, as never before in the history of the veterinary profession, is the time to strive for this end: it is a national necessity and nothing and nobody must be allowed to sabotage our efforts. We look forward to the full assistance of the Agricultural Research Council, the Animal Health Division and the National Farmers' Union, together with that of every member of the profession.

The war has brought us an opportunity of proving our worth such as we have never had in times of peace. Let us "go to it."

H. W. Steele-Bodger.

WORK HORSES NORTH AND SOUTH OF THE BORDER

"Having become accustomed to the type of heavy horse, rather a shapeless old plug usually, one sees on many English farms, a friend who has just wandered over the Border comes back full of praise for the sort of horse he met on the everyday farm up there," writes the Editor of the *Farmer's Weekly* in his "Diary." "Mostly the Clydesdales to be found there are good class, active animals with plenty of good timber, and some of the geldings are of the 60- or 70-guinea order. Of course, this is real Clydesdale country, and the quality is due to breeding—not feeding.

"It has to be remembered, too, that far from being always buyers of farm horses, many of these farmers are sellers—and sellers in a useful market even in these tractor days. It pays to breed well up there.

"In the south of England the opposite is the case. If you want to see real good horseflesh, you go, not to the farms, but to the streets of London, and the big docks. In view of the conditions they live under, and the fact that they never see much pasture, the conditions of some of these Shires is wonderful. That's oats."

CLINICAL COMMUNICATION

Treatment of a Double Cryptorchid Colt with Chorionic Gonadotrophin

D. L. O'BRIEN, B.SC., M.R.C.V.S.
EPSOM

The subject was a yearling half-bred colt which was first seen by me at the end of June this year. The animal was in very poor general condition, and was suffering from a very obvious scrotal hernia, about the size of a coconut, on the near side. Careful palpation of the hernial contents revealed what appeared to be a very under-developed testicle but the other elements in the sac made it impossible to be certain of this. On the off side no sign of testicle could be felt. An examination was made per rectum but still no sign of the off side testicle could be recognised.

During the winter and up to the time it was seen by me, the colt had been kept in a small yard with a shed in it and had been fed on hay and a small amount of concentrates. The owner had kept the colt in because he was afraid that the hernia might get larger if the animal gorged itself with grass or galloped round the field.

As the colt was in poor condition and generally under-developed it seemed to me to be essential that it should get plenty of green food. I recommended that it should be turned out, having first been wormed. This was done.

I injected the colt with 500 rat units of chorionic gonadotrophin at weekly intervals. The preparation used was Antuitrin "S" of which 1 c.c. was given intravenously.* The hernia was treated by using a counter-irritant lotion (Bone Radiol) on three consecutive days, resting for three days and repeating till the skin got thickened and tender. Treatment started on July 8th, 1940.

At the time of the second injection the counter irritant was beginning to take effect. By the third injection there seemed to be something that might have been a testicle on the off side, the hernia was showing definite signs of becoming reduced and the colt was obviously picking up in condition. At each subsequent visit the testicle on the off side became more recognisable as such and the hernia became more reduced. Altogether five injections of Antuitrin "S" were given. By August 8th, the hernia was completely reduced and both testicles could easily be recognised though they were both very small and flabby. The skin was still thickened and rather sore from the use of the Bone Radiol.

The colt was next seen on August 24th by which time he had improved in condition quite remarkably and developed out of all recognition. It was decided to castrate him. On August 28th the colt was cast and chloroformed. On being put on his back with the hocks well flexed both testicles were quite obvious in the scrotum. He was castrated in the ordinary way except that on the near side the skin was dissected away from the dartos which was ligatured after removal of the testicle.

*This was suggested by Messrs. Parke Davis & Co., the manufacturers of this material.

It is obvious that no definite conclusions can be arrived at from one isolated case, but my observation of this one leads me to believe that the injections of gonadotrophin played a very prominent part in the development and descent of the testicles.

An interesting article by Bottomley, A. C., Folley, S. J., and Scott Watson, Helen, M., on the use of chorionic gonadotrophin in the treatment of sterility in cattle appeared in the *Journal of Agricultural Science*, Vol. XXX, part 2, April, 1940. [The article is abstracted below.—*Editor*.]

ABSTRACTS

[EXPERIMENTS ON THE USE OF CHORIONIC GONADOTROPHIC (PREGNANCY URINE) EXTRACT FOR THE TREATMENT OF STERILITY IN DAIRY CATTLE. BOTTOMLEY, A. C., FOLLEY, S. J., and SCOTT WATSON, HELEN M. *J. Agric Sci.* **30** (2). 235-243.]

Human pregnancy urine has been found to contain large amounts of gonadotrophic hormone. The material used in these experiments was a concentrated extract of pregnancy urine supplied by Messrs. Parke, Davis & Co., known as Antuitrin S (A.S.), and standardised to contain 500 rat units per c.c.

This material has been shown to stimulate the interstitial cells of the testis and, therefore, might be expected to produce beneficial results in certain forms of sterility in the bull. Three bulls were treated as they were failing to get cows in calf. Examination of their semen showed a subnormal number of sperms and these were of low motility. Each bull was given two 2 c.c. doses of A.S. intramuscularly at an interval of two days. It is claimed that these injections had remarkably beneficial results.

In cows in which corpora lutea or cysts cannot be detected in the ovaries failure to come into oestrus may be due to a low rate of secretion of gonadotrophic factors by the pituitary or to a wrong balance of the follicle-stimulating and luteinising fractions. It was, therefore, considered that A.S. would have a beneficial effect in some cases. [In others, it would presumably be contraindicated.] Doses of 5 c.c. of A.S. were given intravenously to four cows which had failed to come into oestrus. Two of these responded to the injection, coming into oestrus the following day. They did not become pregnant as a result of service on that date, but one conceived one month and the other five months later. Four cows were given 3 c.c. of A.S. intravenously, one responded and came into oestrus the following day but did not conceive until four months later. At two to five-day intervals ten cows were each given three to four 2 c.c. doses of A.S. intramuscularly. Three of these cows came into oestrus, two conceived at the induced service and one a month later.

Where cows come into oestrus but fail to conceive, the condition may be due to a deficiency of the luteinising factor. It was, therefore, considered that S.A. would have a beneficial effect. It is admitted that in some cases this condition may be due to an excess of luteal tissue, and Hammond has claimed good results by squeezing out the corpus luteum eight to twelve days after oestrus. A herd experiment was

carried out over a period of one year. Three intramuscular injections of 2 c.c. of A.S. were given to cows which had previously failed to conceive; the first injection was given on the day of service and the others at two-day intervals. It is claimed that this considerably increased the percentage of successful services.

[An understanding of the rationale of hormone therapy can be obtained by consulting *Recent Advances in Sex and Reproductive Physiology*. Robson, J. M. J. & A. Churchill, 1940.]

J. F.

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[THE EFFECT OF VACCINATION IN GUINEA-PIGS WITH THE VOLE ACID-FAST BACILLUS ON SUBSEQUENT TUBERCULOUS INFECTION. Wells, A. W., and Brook, W. S. (1940.) *Brit. J. exp. Path.* **21.** 104-110.]

It had previously been found that a subcutaneous inoculation of less than 5 mgm. of vole acid-fast bacillus did not produce progressive disease in guinea-pigs.

Experiment 1.—Three guinea-pigs were inoculated subcutaneously with caseous material from naturally infected voles. They developed a local lesion, but there was no evidence of generalised disease. Nine months later these three guinea-pigs and three control guinea-pigs were inoculated subcutaneously with 0·000,001 mg. of a one-month-old culture of bovine tubercle bacilli of low virulence. One of the control pigs died of intercurrent infection. The remainder were killed after six months. There were small local lesions in two of the vaccinated animals and one had two small tubercles in the lungs, whereas the two controls had extensive generalised tuberculosis.

Experiment 2.—Three groups of five guinea-pigs were used. The guinea-pigs in Group 1 received 1 mg., and those in Group 2 0·1 mg. of a two-month-old culture of vole acid-fast bacillus. Group 3 was left as a control. Three months later, all guinea-pigs received a test dose of 0·000,001 mg. of a recently isolated culture of human tubercle bacilli. When they were killed three months later, those in Group 1 had only small local lesions. Two guinea-pigs in Group 2 had small local lesions but two others showed slight generalisation, and one died before three months with generalised tuberculosis as did the controls.

Experiment 3.—There were four groups of guinea-pigs in this experiment. Groups 1 and 2 consisted of 26 animals each, and they were treated in exactly the same way except that a different strain of vole acid-fast bacillus was used to vaccinate each group. Four weekly injections of 0·5 mg. of a two-month-old culture of the bacillus were given to each guinea-pig. Group 3 consisted of 30 animals each of which received four weekly doses of 7·5 mg. of a one-month-old B.C.G. culture. Immunity was tested five months after vaccination, but in the meantime an epidemic disease had reduced the numbers in Group 1 to nine, Group 2 to ten and Group 3 to eight. The Group 1, and four of the Group 3 guinea-pigs each received 0·000,001 mg. of a recently isolated culture of human tubercle bacilli whilst the Group 2, and four of the Group 3 guinea-pigs were injected with the same dose of a recently isolated bovine strain. In Group 4, which consisted of 16 unvaccinated controls, half received the bovine and half the human strain of tubercle bacilli.

All animals except two in each of Groups 1 and 2 were killed after 11 weeks. Only two pigs in each of these groups showed slight generalisation, the remainder had only a local lesion. The guinea-pigs in Group 3 all had generalised tuberculosis and the controls showed extensive generalised tuberculosis. At the time of inoculation with the test dose all guinea-pigs were tuberculin tested. The allergy in those vaccinated with the vole bacillus was little or no greater than those vaccinated with B.C.G.

J. F.

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[EFFICACY OF NON-CONDITIONED PHENOTHIAZINE IN REMOVING WORMS FROM THE ALIMENTARY CANAL OF CATTLE. Swanson, L. E., Porter, D. A., and Connelly, J. W. (1940.) *J. Amer. vet. med. Ass.* **96.** 704-707.]

Swanson, Porter and Connelly describe the materials and methods used in testing the efficacy of phenothiazine for the removal of gastro-intestinal helminths from cattle. The drug was the non-conditioned product (without a wetting agent) and was placed in gelatin capsules, lubricated with mineral oil, and administered with a balling gun. The animals were calves obtained from herds where losses due to parasitic gastro-enteritis had occurred and were, for the most part, in poor condition. The authors discuss the experimental results, which are also given in tabular form, and mention that non-conditioned phenothiazine removed 100 per cent. of mature *Haemonchus contortus* and *Trichostrongylus axei* and 99·8 per cent. of *Oesophagostomum radiatum* from calves when administered in doses varying from 50 to 80 gm. (*i.e.*, 0·44 to 1·1 gm. per kg. of body weight). In tests with six animals it was found that the drug was less effective against the hookworm, *Bunostomum phlebotomum*, in calves weighing over 91 kg. (200 lb.) when administered at a dose rate of 0·44 to 0·55 gm. per kg. of body weight than when given to lighter calves at a dose rate of 0·66 to 1·1 gm. per kg. of body weight. The drug was found to be approximately 84 per cent. effective against *Ostertagia ostertagi*; only slightly effective against *Cooperia* spp., although a larger percentage of *C. pectinata* than of *C. punctata* was removed by treatment; and ineffective against *Trichuris* sp., *Strongyloides papillosus* and *Moniezia* sp. Phenothiazine was found, by the authors, to be comparatively non-toxic for calves and they mention that it shows considerable promise as an anthelmintic for gastro-intestinal nematodes in cattle although it would appear to be too light and bulky in its crude form for practical administration in capsules. Further work on the size of the dose and dosage methods is in progress.

J. N. O.

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[STREPTOCOCCIC INFECTIONS IN DOGS. II. PATHOGENICITY, "ACID MILK," CONVULSIONS, TONSILLITIS, ABSCESSES, CONJUNCTIVITIS AND SKIN CONTAMINATION. Stafseth, H. J. (1940.) *J. Amer. vet. med. Ass.* **96.** 230. 2 tables, 3 refs.]

This paper is a record of laboratory inoculations and experiments with cultures of streptococci recovered from the clinical entities detailed in the title. In view of the variety of the tissues from which streptococci were isolated, the author does not think it logical

to ignore them altogether, although all attempts at reproducing the diseases by injection were complete failures. He further suggests that viruses or other pathogenic factors may be the provocative or predisposing causes.

The strictest attention to kennel hygiene is suggested as the best means of preventing the spread of infection.

Stress is laid upon the fact that antiseptics and disinfectants, as ordinarily applied, are not efficient in sterilising the skin of dogs and that greater care should be taken when injecting materials not readily absorbed, especially when large doses and large needles are used.

J. S. P.

REVIEW

[HOW TO RAISE A DOG IN THE CITY AND IN THE SUBURBS. By James R. Kinney, v.m.d., and Ann Honeycutt. Illustrated by James Thurber. Hamish Hamilton, 90, Great Russell Street, London.]

The authors have "achieved the impossible" in producing an entirely original and eminently readable book on the health and care of dogs. So much solemn nonsense has been written on this well-worn theme (sometimes by people who should know better) that it is refreshing to meet with a volume packed with truth written in jest.

Of course, some of the matter is open to criticism, though the authors have rather successfully drawn the critic's teeth. We hesitate to accuse such ingenuous writers of subtlety, but it is a fact that they go out of their way more than once to emphasise that there are differing opinions, while hinting that theirs are, on the whole, by far the soundest.

There is much to justify this. The advice on breeding is excellent and so simple that the veriest amateur can follow it, while the instructions on the care of common ailments could not well be bettered. We observe that the author's faith in distemper inoculation, despite its proved efficacy, is somewhat wavering, though they wisely recommend it.

But this book is not only an ever-present help in times of trouble—it deals intelligently with the everyday difficulties of the inexperienced dog-owner wherever his habitat, a thing that few writers on canine subjects have troubled to do.

For this alone the book will be welcomed by hundreds who are yet in their canine novitiate, when more pretentious works are flung impatiently aside. Nor will the veteran who takes up this work feel inclined to lay it down. The humour that informs the script and the delightfully original drawings, combine to make a volume as amusing as it is useful.

A special correspondent of *The Times* says: "The Danish and German authorities in Copenhagen have jointly decided immediately to reduce the pigs and poultry of Denmark by half because of the difficulty of obtaining feeding stuffs. There will thus be slaughtered 1,500,000 pigs and 7,000,000 hens, as well as 150,000 milch cows and 200,000 heifers. Almost the whole of this meat will go to Germany.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Oct. 18th.—General Meeting of the Mid-West Division, N.V.M.A., at Bath, 2 p.m.

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Communications for "The Veterinary Record": New Postal Address

The Editorial Department has been included in the decentralisation arrangements made with the object of ensuring continuity in the conduct of Association business under the present emergency conditions. Request is therefore made of all concerned to note particularly that communications for this journal, in respect of both literary and advertising matter, should no longer be addressed to 36, Gordon Square, W.C.1, but as follows: **The Editorial Representative, N.V.M.A., 85, Handside Lane, Welwyn Garden City, Herts.**

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The General Secretary, N.V.M.A.

As intimated in our last issue, the General Secretary of the N.V.M.A., Mr. F. Knight, whose house in North London and all his personal possessions were demolished by a direct hit from a bomb, has taken up his residence at 10, Bore Street, Lichfield. Association correspondence should be addressed to him, however, c/o H. W. Steele-Bodger, Esq., M.R.C.V.S., 63, Lichfield Road, Sutton Coldfield, Warwickshire (Tel. Sutton Coldfield 1608 and 1609).

Mr. Knight desires to take the opportunity afforded by the re-insertion of the above address announcement to express his deep gratitude to the many members of the Association who have written to him tendering their sympathy with him and his family on the distressing experience they have undergone, with the loss of their home, and expressing their thankfulness that all escaped with their lives and were spared serious injury.

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N.V.M.A. Annual General Meeting

Though inevitably in some respects "the pale shadow of its former self," the Annual General Meeting held at Oxford on Wednesday last brought a muster of members and their ladies most creditable to the Association under the travel-intimidating circumstances of the time and, indeed, presented certain features that rendered the occasion worthy of special note.

The whole proceedings—which will be recorded in full in a later issue—in particular, the President's Address, represented a declaration of the Association's will and intention to assist the organised profession to play at this time of national need the part for which its personnel are specially fitted—that of husbanding the country's resources of livestock and livestock products. The activities of the N.V.M.A. have by no means been curtailed: rather have they been sublimated to meet the above requirement, to safeguard to the utmost extent possible the well-being of its members, and to assist the hard-pressed agencies of the profession for the alleviation of distress. In these and many other respects—*e.g.*, the question of "reservation," the work of the "Survey" Committee, the association with the activities of the National A.R.P. for Animals Committee, and the emergency measures taken to ensure continuity in the affairs of the "National" under war-time conditions—the business transacted, with special reference to the terms of the Secretary's Report, reflected the major concerns confronting our community of members.

. . . . .

No surprise and much pleasure will be caused by the intimation that the occupancy of the chief executive posts—those of President, Vice-Presidents, Hon. Secretary and Hon. Treasurer—is to remain unchanged. The re-election to these respective offices of Mr. Steele-Bodger, Major DeVine and Dr. Wooldridge (President-Elect, Vice-President and Hon. Secretary) and Mr. Bywater is a high tribute to the sterling qualities each has shown in truly trying circumstances and a vote of confidence in their ability safely to guide the destinies of the Association during the increasingly difficult times which, it would seem, must lie ahead for us and all our countrymen before the dawn of the brighter day to come.

Concerning the Presidency, it must be obvious to all that an office that in normal times had developed into the fair semblance of a full-time occupation must, in years like these, represent a burden only to be borne with the exercise of a rare staunchness of spirit. In the case of Mr. Steele-Bodger the accepted value of continuity of office in circumstances of special stress is enhanced by the fact that he has stamped his personality on each of the many links forged between the Association and other bodies vitally concerned with the problem of enabling the nation to make full use of its animal resources. Throughout the most exacting Presidential year in its history the N.V.M.A. has had at its head one whose vigorous and purposeful leadership has become an inspiration to every member, and the acclamation which greeted his re-election, after his delivery of a masterly and stimulating President's Address, expressed not only a full measure of confidence arising from proof of worth, but of gratitude for his loyal and generous readiness to shoulder the task for another period of uncertain outlook but assured strain.

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Under current conditions it would seem that, of all the Association's "aims and objects," that which seeks to foster scientific progress would be the most formidable to pursue. However, witness to the fact that sight is not being lost of this aspect of the work of the N.V.M.A. was forthcoming not only in the references to the activities of the "Survey" and other committees concerned with scientific investigation but in the renewed award, after the lapse of one year, of the "Dalrymple-Champneys" Cup and Medal, which is bestowed in recognition of the recipient's meritorious services to the veterinary profession through research and in other ways. The gesture of making the donor—a close friend of the profession of long standing—an Honorary Associate was warmly greeted by the assembly.

This journal takes special pleasure in the fact that this year's holder is Dr. J. T. Edwards—a valued contributor who as a former Editor and, over a long period of years, as a hard-working member of the Editorial Committee, has laboured unceasingly on its behalf. In August last Dr. Edwards' work was accorded similar recognition in another quarter, when the Committee of Management of the *Journal of the Royal Army Veterinary Corps* awarded him the Sir Frederick Smith Memorial Medal, bestowed for contributions of outstanding merit.

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The presence at Oxford—and participation in the informal luncheon—of ladies "up" for the Annual General Meeting of the Ladies' Guild was a pleasing reminder of the fact that ordinarily the Annual Meeting *cum* Congress of the Association takes rank as a great social occasion, a leading feature of which is the Guild Dance in aid of the Victoria Veterinary Benevolent Fund—its parent body. The undertaking given by the President and other Officers of the N.V.M.A., in these columns on October 5th and to members individually, that the Annual General Meeting would be asked to vote a sum in support of the charities of the profession, was duly honoured and the loss to this Fund of the proceeds of a "Congress" Dance accordingly will be much more than offset by an Association contribution of £1,000 to be used for the benefit of members of the N.V.M.A. or their dependants. The "National" has thus given an official lead which everyone who is in a position to do so should endeavour to follow forthwith, for none can foresee any limitation to the charitable expenditure which must be faced by the societies concerned.

The Profession and Military Service

As reported in our issue of August 17th, the Council of the Royal College of Veterinary Surgeons, after carefully considering the question of the continued inclusion of veterinary surgeons in the schedule of reserved occupations, resolved to recommend that veterinary surgeons should remain reserved, but that a tribunal should be set up to which any practitioner who wished to join the armed forces might appeal against reservation. This recommendation has been sent to the Ministry of Labour and is being considered in consultation with the Government Departments concerned.

In the meantime the rule holds that any person who is in a reserved occupation who becomes unemployed for a period of two months may, if he so desires, volunteer for military service.

It is the view of the Councils of the National Veterinary Medical Association and of the Royal College, however, that there is so much work of vital importance to the community which veterinary surgeons can best perform but which has not yet been undertaken, that it would be a folly to waste this potential stimulus to our national endeavour by putting veterinary surgeons into the fighting line. The enemies they are trained to fight are those animal diseases which take such a toll of our livestock—abortion, sterility, mastitis, etc. The Survey Committee of the Association is giving the most earnest and diligent study to this question, and we hope to be able to report shortly the recommendations which will be made to the Ministry of Agriculture and the Ministry of Food. In the meantime, we can only counsel veterinary surgeons to be patient awhile, and not deplete the ranks of those whose services may be called upon for the preservation of our livestock by seeking military service in a non-professional capacity —for the services which the veterinary profession can render to the community cannot be adequately supplied by any other profession.

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The *Brucellosis melitensis* Order of 1940

We are indebted to Professor G. S. Wilson, M.D., F.R.C.P., D.P.H., of the London School of Tropical Medicine and Hygiene, who is now assisting in the work of the Emergency Public Health Laboratory at Oxford, for the following note on the circumstances which led to the issue of the above Order :—

As is well known, there are three main types of *Brucella*. The *melitensis* type was first of all isolated by Bruce in 1887 from fatal cases of undulant fever in Malta. Nearly 20 years elapsed before Zammit found that this organism is a natural parasite of goats and is excreted in their milk. The *abortus* type was described in 1897 by Bang, who, in conjunction with Stribolt, showed that it was responsible for contagious abortion in cattle. The *suis* type, which is a natural parasite of pigs and gives rise to lesions in their reproductive organs, was isolated by Traum in the United States in 1914. All three types are able to give rise to undulant fever in man, though the *melitensis* type appears to be the most pathogenic and the *abortus* type the least. Generally speaking, the *abortus* type is widespread among cattle throughout the world ; the *melitensis* type is confined mainly to goats and sheep along the Mediterranean littoral, though under favourable conditions it may infect cattle ; and the *suis* type finds its chief home in the middle western states of North America.

Up till the spring of this year, *Br. abortus* was the only type that had ever been isolated in this country from an indigenously infected animal or human being. In April, however, Dr. Menton, the County Bacteriologist for Stafford, whose untimely death has recently been announced, isolated a *Brucella* organism from a guinea-pig that had been inoculated six weeks previously with the mixed milk of an Accredited herd in the Midlands. Finding that, unlike most *abortus* strains, it grew aerobically on primary culture, he suspected that it might be a vaccinal strain of *Br. abortus*, but as some of its other characteristics were a little peculiar he decided to send it for further study to the Emergency Public Health Laboratory at Oxford. There it was identified as belonging to the *melitensis* type. The finding of this organism for the first time in this country raised many questions. The agricultural authorities were alarmed by the danger incurred by the highly susceptible sheep and goat population, while the Ministry of Health was almost equally exercised over the possible development of undulant fever on a large scale among the human population. Both bodies were united in trying to solve the administrative problem of preventing the infection from spreading beyond its original bounds. This was rendered peculiarly difficult by the fact that, shortly after the milk had been sampled, the original owner of the infected herd had held a dispersal sale at which about 150 animals had been sold off. Only 21 of these animals were bought by the succeeding owner and kept on the infected farm. The Ministry of Agriculture decided to trace all animals from the original herd, to examine their blood serum for *Brucella* agglutinins, and in addition to examine quarter samples of all cows in milk. Working with great expedition the Divisional Veterinary Inspector and his staff collected the necessary specimens, which were examined in duplicate by the Ministry of Agriculture's own laboratories at Weybridge and by the Emergency Public Health Laboratory at Oxford. Five cows were found to be actually excreting *Br. melitensis* in their milk. Two of these were removed from the original herd at the dispersal sale, and of the three purchased by the new occupier two were re-sold some months later. The Ministry of Agriculture therefore decided, after consultation with the Ministry of Health and the local public health authorities, that all animals in the original herd must be slaughtered. Since no powers existed to do this, it was necessary to issue a special Order, the *Brucellosis melitensis* Order of 1940. This came into operation on July 3rd. Under Section I of this Order the Minister may, if he thinks fit, cause to be slaughtered any animal, including cattle, sheep, goats and swine, which in his opinion is affected with the *Brucellosis melitensis* or has been exposed to the infection of that disease. By virtue of this clause all the cattle and sheep sold at the dispersal sale were slaughtered, as well as cattle, sheep and pigs brought on to the infected farm by the new occupier. Herds into which infected animals were introduced are now being kept under close observation, and blood serum and milk tests will be made at intervals. In this way it is hoped that the infection will be completely eradicated. If these measures should fail then a new disease

of grave concern to both the veterinary and the medical professions will have been added to the long list with which they are already acquainted. How the infection was introduced in the first place remains a mystery. The possibility that a *melitensis* strain was included in one of the live vaccines which had been given cannot be excluded, though the examination of vaccine bought in the open market and of several strains from the laboratory supplying the vaccine lent no support to this view. In conclusion, tribute should be paid to Dr. Menton, whose vigilance was responsible for the original discovery, and to the officials of the Ministry of Agriculture who realised at once the seriousness of the problem and spared no pains to cope with it.

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LEGAL NOTES

Contravention of the Brucellosis melitensis Order (1940).—What would appear to be the first case brought under the recently-issued *Brucellosis melitensis* Order (1940) was heard at Cannock on September 19th, when B. C. Griffin, of the Toft, Dunston, was fined £6 for moving cattle after notice not to do so, 20s. for moving a beast without a licence, and ordered to pay 4s. costs for moving cattle without their being accompanied by a licence. He was also ordered to pay £3 3s. 0d. solicitor's costs, making a total of £10 7s. 0d.

Prosecuting, Mr. F. Cooper said the incidents arose as a result of an order in connection with an extremely contagious disease. It was a disease rare in this country, but early this year there was trouble with it, and an order was made early in July. Defendant had an animal in his possession which was suspected of having had the disease, or being in contact with it, so he was served with a formal notice.

In view of the importance of the matter, the Chief Constable directed that defendant should be seen by a police officer, and the importance of strict compliance with the notice pointed out to him. That was done on July 14th. Two days later, defendant applied to the proper authority for a licence to move six of his animals from the pasture to Penkridge smithfield, and the licence was granted. The first condition on the licence was that the cattle must be moved by float or other vehicle, and that the licence must accompany them on the journey.

Police evidence (then called) showed that two days later an employee of defendant walked seven animals into the Penkridge smithfield: the licence was not forthcoming. Defendant later produced the licence, and said he knew he had not complied with the regulations. He had not looked at the licence. He never did read them.

For defendant, Mr. A. D. Dallow said the only charge of substance was that of not moving the cattle in a float, and the other two charges would probably not have been brought but for that. The licence was produced in a very short time. The application for the licence was made by telephone, and was applied for to cover eight animals, but when it arrived it was made out for six instead of eight. Seven cattle were moved, and had not one in the field run about so wildly that also would have been moved, making eight in all. Defendant thought the licence was for eight, but unfortunately he did not look at the licence.

Mr. Dallow added that as defendant had not read the licence, he did not know about the condition that the animals must be moved by float. It was a Mediterranean disease, and the order making it a Disease of Animals Order only came into operation on July 3rd, and had, therefore, only been in operation about 15 days.

The Chairman (Alderman J. Baker) said defendant had without doubt committed a breach of the order, which it had been found necessary to make for the protection of defendant and others like him. It was a comparatively recent order, but defendant was aware of it, because he applied for a licence. He said he did not read licences. Maybe he adopted an attitude that he knew all he wanted to know, but if that was so it would not pay him. The disease could be communicated to human beings. The bench, however, were not taking too serious a view of the matter, in view of the order being so recent and of what Mr. Dallow had said.

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UNDULANT FEVER IN NORMANDY

In his inaugural thesis (*Thèse de Paris*, 1940, No. 322), Dr. M. L. Rose-Legrand remarks that until the last few years the five departments of Normandy were regarded as free from human undulant fever. Recent publications, however, indicate that Normandy has by no means escaped visitations of this disease, as is shown by the fact that the writer has been able to collect at least 27 cases in the course of the last six years, eleven being in Seine-Inférieure, six in Calvados, five in Eure, three in Manche and one in Orne. With the exception of a single case caused by *B. melitensis*, all the cases of human undulant fever have resulted from infection by *B. abortus bovis*. Not a single case in the departments of Normandy has been due to goats or sheep. In two instances infection was caused by accidental inoculation, namely, by a polyvalent vaccine in a veterinary surgeon, and in another in a cattle-breeder. In the majority of cases inoculation has taken place through the skin and only in a minority by consumption of raw milk from infected cows. Hitherto, there have been no instances of human infection by cheese. In conclusion, the writer recommends that the well-established existence of undulant fever in Normandy should receive the attention of veterinary and medical practitioners, especially in rural districts. In another thesis (*Thèse de Paris*, 1940, No. 277), Dr. R. G. C. F. Grigny states that he has recently collected ten cases of undulant fever which have occurred during the last four years in the department of the Somme, where contagious abortion has recently been frequent among the cattle.—*Nature*.

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GOVERNMENT CONTROL OF MILK

As the result of an Order to be known as the Milk Marketing Board (Modification of Functions) Order, 1940, the production, marketing and manufacture of all milk will be regulated by the Milk Marketing Boards under the direction of the Ministry of Food. In the past the Boards have operated as the servants of the farmers under the Agricultural Marketing Act, 1931. The relations between the Boards and the farmer are to remain substantially the same. The aim of the new Order is to enforce the Ministry's milk policy and to maintain production. It also controls prices and is intended to effect economies in transport costs.

While the Order gives the Boards new and wider powers, the effect is to bring them under almost complete control by the Ministry of Food," comments the *Farmer's Weekly*. "The Board, with the Ministry's consent, will continue to fix pool prices. They may also require producers to sell only to or through the agency of the Board. The Board will also have power to buy or sell with the Ministry's consent any commodities produced from milk."

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UNCLEAN MILK

The *Scottish Farmer* reports that at a recent meeting of the Wigton (Cumberland) Rural District Council, a discussion arose on the cleanliness of milk.

Dr. Simpson, Medical Officer, reported that the milk samples taken since June had deteriorated very considerably and the last batch were the worst ever taken. They had always noticed that the samples taken about harvest-time were not nearly so good as at other times, but this year they had been deplorably bad. Of the last 62 samples taken 13 were satisfactory, 27, or 43·5 per cent., unsatisfactory, and 22, or 35·5 per cent., very bad. They had also noticed that the recent falling off in the standard of cleanliness had not been confined to the "usual" unsatisfactory producers, but several who had had very excellent, and in some cases perfect records, had had a black mark put against their names for the first time. There were, however, still several producers who had maintained an unbroken record of anything up to 15 consecutive satisfactory reports, and he considered the very greatest credit was due to them and others with nearly as good records for the way they consistently turned out clean milk.

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"MAINTAIN THE HERDS"

As our readers are already aware, the Survey Committee of the N.V.M.A. has for some time been engaged in evolving schemes for controlling diseases of dairy cattle with a view to preventing waste of milk and meat and increasing these commodities. In connection with this matter, so vital to the nation at this time, we note with special interest the following paragraphs, under the above heading, appearing in a contribution to the September issue of the *Home Farmer* by Professor W. A. Ashby, M.A., of the Department of Agricultural Economics, University College, Aberystwyth, entitled "Milk Production in the Second Year of War."

Professor Ashby writes: "With the best conditions that can be foreseen it is probable that it will be difficult to maintain milk yields at the same average level per cow as in recent years. If this is the case, it is fortunate that the nation's herd has been well maintained, and that farmers began to prepare for increased numbers of calving heifers soon after the war began. *This process should be continued.*

"Every heifer calf should be reared if it is likely to make a good dairy cow, or a fair dairy or beef animal as future conditions may require. Extra care of cows for avoiding such diseases as are avoidable, extra care in securing effective mating, will yield economies to farmers and the nation. On all grounds of economy the dairy industry could plan for and ask for support in obtaining a large increase in calving heifers during 1941.

"While the Government, the Milk Marketing Board, and producers prepare to maintain the dairy herd and the milk supply, it is also necessary that distributing and manufacturing services be reviewed. . . . The nation needs milk. Producers can provide it. But when producers have done their part it is necessary to organise to make the utmost use of the human food values in their produce."

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IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESAR AND IZATNAGAR, INDIA

Owing to the increasing size of this Institute and consequent heavier responsibilites of the Director, the Government of India have agreed to the appointment of a Deputy Director. We are pleased to announce that the first person selected to hold this position is Mr. J. R. Haddow, B.Sc., M.R.C.V.S., D.V.S.M., I.V.S. Officer-in-charge of the Pathology and Bacteriology Section of the Institute.

PERSONAL

Birth.—Taylor.—On September 27th, at the Norwood Nursing Home, Glasgow, to Nan, wife of Ronald F. Taylor, 7, Kingscliffe Avenue, Glasgow, S.4, a son.

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Mr. N. S. Barron's Doctorate.—At a recent meeting of the Senate of the University of Reading it was announced that the degree of Ph.D. had been conferred upon Mr. N. J. Barron, B.Sc., M.R.C.V.S. Mr. Barron, who is a Veterinary Investigation Officer, took as the subject of his thesis "Vitamin A and its Relationship to Disease in Animals."

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THE LATE R. L. CORNELL, B.Sc., M.R.C.V.S.

A Further Appreciation

In connection with the passing of Mr. R. L. Cornell, which sad event has called forth several tributes from colleagues which we have been privileged to publish, Mr. H. J. Lowe, Director of Veterinary Services, Tanganyika Territory, writes: "The death of Mr. R. L. Cornell, B.Sc., M.R.C.V.S., at Bangkok, Siam, on August 4th, 1940, came as a great surprise to us of the Tanganyika Veterinary Department, Tanganyika Territory, where he was our Veterinary Research Officer since 1928, in which year he came to the department in that capacity. He was selected for secondment to Somaliland in 1930 until 1932, when he resumed his substantive appointment in Tanganyika Territory. During a visit to the United States of America and Canada in 1934, Cornell attended a course at the Institute of Parasitology, McGill University, Montreal. In 1937 he was again seconded, this time as Veterinary Adviser to the Government of Siam—a post which he retained till his death.

"Your columns will have borne witness to the width of Cornell's experience. In Tanganyika we recognised his outstanding ability. His work was always characterised by careful attention to detail and his opinions and advice were regarded with the utmost confidence. One has only to study his contributions to veterinary literature in the *Journal of Comparative Pathology and Therapeutics* and the Annual Report of the Department of Veterinary Science and Animal Husbandry, Tanganyika Territory, from 1928 onwards, to appreciate the quantity and quality of his work.

"As a professional colleague and friend of Cornell for many years, I cannot allow the occasion to pass without recording my great sorrow at his decease, especially at such an early age, and on behalf of this department of which he was a senior member I wish to express my deepest sympathy with his relatives."

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SCIENTIFIC WORKERS AND THE NATIONAL WAR EFFORT

In order to ensure the continuance of the fullest co-operation of scientific workers with the Government in the national war effort, the Lord President of the Council, after discussion with the Royal Society, has, with the approval of the Prime Minister, appointed a Scientific Advisory Committee with a Secretary from the Cabinet Secretariat. The members are:—

Lord Hankey, G.C.B., G.C.M.G., G.C.V.O., Chancellor of the Duchy of Lancaster (Chairman).

Sir William Bragg, O.M., K.B.E., President of the Royal Society.

Dr. E. V. Appleton, F.R.S., Secretary of the Department of Scientific and Industrial Research.

Sir Edward Mellanby, K.C.B., F.R.S., Secretary of the Medical Research Council.

Sir Edwin Butler, C.M.G., F.R.S., Secretary of the Agricultural Research Council.

Professor A. V. Hill, O.B.E., F.R.S., M.P., Physical Secretary of the Royal Society.

Professor A. C. Egerton, F.R.S., Biological Secretary of the Royal Society.

The terms of reference of the Committee are:—

(*a*) To advise the Lord President on any scientific problem referred to them.

(*b*) To advise Government Departments, when so requested, on the selection of individuals for particular lines of scientific inquiry or for membership of committees on which scientists are required, and

(*c*) To bring to the notice of the Lord President promising new scientific or technical developments which may be of importance to the war effort.

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VACCINATION AGAINST TUBERCULOSIS WITH THE VOLE BACILLUS

"The history of scientific research abounds with instances of advance in one field following on a discovery, perhaps unimportant in itself, in another," states a leading article in a recent issue of the *British Medical Journal*. "The frontal attack is not necessarily the most successful. Progress may be suspended till a chance clue obtained by a worker in some entirely different subject points the way to the real method of approach. A striking example of this is afforded by the recent observations of Wells and Brooke[1] on the immunising power of the vole acid-fast bacillus. Some years ago Elton at Oxford was anxious to find out the causes responsible for the great variations noticed from year to year in the numbers of wild rodents. Voles, for example, would increase over a period of three or four years and then die in prodigious numbers within a month or two for no obvious reason. In his search for likely causes Elton naturally considered the possibility of epidemic infection of one kind or another, such as had been shown by Topley and his colleagues to be responsible for wave-like fluctuations in the numbers of mice observed under laboratory conditions. He was successful in interesting Wells in the subject, and it was not long before a high mortality among voles in different parts of the country provided material to work on. *Post-mortem* examination revealed the presence in some of these animals of a curious disease resembling partly tuberculosis and partly rat leprosy. Acid-fast bacilli were abundant in the lesions, and cultivation resulted in the development of colonies on suitable media. Pathogenicity tests showed these organisms to be highly virulent for voles, but relatively avirulent for guinea-pigs and rabbits. Further work left little doubt that they were tubercle bacilli of a type hitherto undescribed, closely related to the human and bovine types but nevertheless distinct from them.

"The possibility of protecting against tuberculosis in mammals by this new organism had clearly to be investigated. Preliminary results of this inquiry obtained by Wells and his colleague Brooke are now recorded. A small initial experiment in which guinea-pigs were vaccinated subcutaneously with caseous material from naturally infected voles and inoculated nine months later with a culture of bovine bacilli of low virulence showed a great difference between the vaccinated and the control animals. In a second experiment two groups of five guinea-pigs were vaccinated with 1 mg. and 0·1 mg. respectively of a pure culture of the vole acid-fast bacillus. Three months later they were inoculated, along with a control group of five animals, with 0·00001 mg. of a virulent human tubercle strain. All the control animals died of generalised tuberculosis within three months. Of the animals vaccinated with 0·1 mg., one died of tuberculosis within two months, two developed slight glandular enlargement, and two showed nothing but a local abscess. The five animals vaccinated with 1 mg. developed a local abscess only. The protective value of vaccination, particularly with the larger dose, was very striking. In a third experiment, which was marred by the death from intercurrent epidemic infection of a large number of the animals, a comparison was made between the protective power of the vole acid-fast bacillus and the well-known B.C.G. strain. Four weekly doses of vaccine were given, aggregating to a total of 2 mg. of culture with the vole bacillus and to 30 mg. with the strain of B.C.G. Five months later half the animals were infected with 0·000001 mg. of virulent human bacilli and half with the same dose of virulent bovine bacilli. The animals were killed after eleven weeks. The 16 control animals had extensive generalised tuberculosis. The eight surviving animals vaccinated with B.C.G. likewise had generalised tuberculosis. Of the 15 surviving animals vaccinated with the vole bacillus there were a few small tubercles in the lungs or viscera in four, while the remainder had no lesions at all or just a small local abscess. The number of animals was unfortunately too small to render the comparison between protective power of the vole and the B.C.G. strain statistically convincing.

"Taking the three experiments together, there seems little doubt that a considerably greater degree of protection was afforded by vaccination with the vole bacillus than with any previously described organism. All who have worked with the B.C.G. strain know how difficult it is to prevent the development of experimental tuberculosis in guinea-pigs by its use. With the vole bacillus, on the other hand, complete or almost complete protection was obtained in the great majority of the animals tested. It would be foolish to draw far-reaching conclusions from the results of these few experiments, but it would be equally foolish to close one's eyes to their possible importance. Observations must now be made on monkeys and on cattle. If these prove satisfactory, then a vaccine should be available which has many advantages over the unstable and relatively ineffective B.C.G. strain. The subject is of such importance that it is to be hoped the war will not be allowed to interfere with its further investigation."

(1) *Brit. J. exp. Path.*, 1940. 21. 104.

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Immunisation of Cattle Against Tuberculosis with the Vole Bacillus

We reproduce below a letter by Professor T. Dalling, M.R.C.V.S., and Dr. A. Stanley Griffith, of Cambridge, which appeared in the *Lancet* of September 28th last. The subject matter of the annotation referred to in the text of the letter appears in this issue of the *Record* (page 734), as an abstract of the original article recently published by Wells and Brook, dealing with experiments upon the protective inoculation of guinea-pigs against tuberculosis by means of the vole bacillus. These authors produced evidence showing that with the vole bacillus a degree of protection could be conferred on guinea-pigs which was much higher than that conferred with B C G.

We shall publish an abstract of Prof. Dalling and Dr. Griffith's fuller account as soon as possible. It is to be hoped that in spite of the present difficulties more extensive experiments can be carried out soon to establish the practical value of these findings, the significance of which will be readily appreciated by our own readers.

Following is the letter:—

The Vole Bacillus

Sir,—Readers of the annotation on page 338 of your issue of September 14th may be interested to know that we have carried out some experiments with the vole bacillus as an immunising agent in calves against bovine tuberculosis. The results are encouraging.

Nine calves were injected with cultures of the vole bacillus, some intravenously, some subcutaneously, some once and some twice. They were fed a virulent culture of bovine tubercle bacilli after intervals ranging from 21 to 175 days from the last injection. *Post-mortem* examinations were made approximately six months later. It was found that in some of the calves a single intravenous or subcutaneous injection protected fully against infection, and that in the other calves macroscopic lesions were only very slight and were confined to the glands adjacent to the alimentary tract. The control calves developed typical widespread tuberculosis.

A full account of this work is being published in the November number of the *Journal of Hygiene*.

T. Dalling,
A. Stanley Griffith.

Cambridge.

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THE VETERINARY STUDENT ENTRY

"The war does not seem to have had any noticeable effect on the entry of students into the veterinary colleges," observes *The Times* in its Educational Supplement, recently issued, and proceeds: "Demand for admission still presses hard on the available accommodation. As veterinary students who have passed their Second Examination are included in the Schedule of Reserved Occupations, those who want to complete their professional qualification without interruption should start the course at about 17½ after passing an examination of matriculation standard. That gives them two years in which to pass the First and Second Veterinary Examinations before they are eligible for military service. For those who wish to remain at school, after passing the School Certificate Examination, the best course is to take the Higher School Certificate course in the principal subjects of Chemistry, Physics and Biology. Those who obtain the Higher School Certificate with passes in these subjects are entitled to exemption from the First Veterinary Examination, and can, therefore, enter as second year students. It is well to give early notice to the principals of the schools of the intention to enter in order that places may be reserved. If there is an interval between the passing of the matriculation examination and entry to one of the colleges which the student does not bridge by staying at school for a Higher School Certificate Course, it would be advisable to spend it on a farm so as to obtain first-hand knowledge of the habits of animals and their management in health.

"Although many veterinary practices have had to be abandoned in certain areas, with as a result some unemployment or under-employment in the profession, there is much veterinary work to be done in the interests of livestock which has never yet been attempted. It is hoped that as a consequence of the war new fields of practice may be opened so as to give employment to larger numbers of veterinary surgeons."

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FOOT-AND-MOUTH DISEASE

Outbreaks of foot-and-mouth disease amongst cattle and pigs at Sowerby, Yorks, and at Llanwrthwl, Brecknock, have been confirmed by officers of the Animal Health Division of the Ministry of Agriculture.

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DOMESTIC POULTRY KEEPERS' COUNCIL

The Domestic Poultry-keepers' Council recently set up by the Minister of Agriculture to guide and assist domestic poultry-keeping has held its first meeting. The Council, as a first step, is proceeding to work out plans for setting up an advisory service for backyard poultry-keepers and is also considering how best arrangements can be made for backyard poultry-keepers to secure, as an addition to household and garden waste, the necessary minimum supplement of purchased feeding stuffs.

H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at Hotel Lindum, St. Anne's, Lytham St. Anne's, Lancs.

	Price net s. d.	*Post free* s. d.
Provisional Rules and Orders:		
Public Health (Tuberculosis) Regulations, 1940	0 1	0 2
Medical Research Council:		
War Memorandum 2. Notes on the Diagnosis and Treatment of Gas Gangrene, with a Suggested Scheme for the Bacteriological Investigation of War Wounds. (45-9-2.) ...	0 3	0 4
War Office:		
Government Department Specification. Textiles and Clothing. T.C. 228, 1940. Overboot, Anti-gas: Light; Heavy, No. 1; Heavy, No. 2. Reprinted) 1940, revised price. (57-9999)	0 2	0 3
Chemical Warfare, Medical Manual, 1940. July, 1940. (57-559-0-40)	2 6	2 9

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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TREATMENT OF STRAINED TENDONS

To the Editor of the Veterinary Record

Sir,—I have carefully read Mr. Fraser's article on the treatment of strained tendons. I would like to point out he has only given the results of cases fired: it would have been much more instructive and interesting if he had given comparative results of other treatments besides the use of the firing iron.

It was my good fortune to be in partnership with the late Wm. Hunting (the Editor of this journal) for 25 years, and he was the ablest and most acute observer of any veterinary surgeon I have ever met. He always held that firing did no good; indeed, he went so far as to say it did harm, as it is a well-known fact that burnt flesh even when healed is never so strong as normal flesh. The old-fashioned idea that line firing acted as a bandage was ridiculous. Many years ago Mr. Hunting and I had the veterinary attendance of a very large stud of light trotting vanners used for fast work. A good many of these horses went lame from bowed tendons and Mr. Hunting tried the following experiment: he picked out twelve horses with both fore legs strained—it is rare to find both legs equally strained, and when this was the case he fired the leg which showed the least signs of the strain or was the least bowed. These horses were rested for about four months and put to work again; in every case the horses went lame again on the fired leg, the other remaining sound.

For many years I have had a large number of thoroughbred horses through my hands, most of which were stallions. I have often bought animals so badly strained that they were on the point of being destroyed—some of them were almost on three legs. I used to take their shoes off and put them in loose boxes, where I kept them for about six months, and I always found their leg or legs became practically normal. I never bought a fired horse as I found their legs never became even nearly

normal; and, moreover, no foreigner I have ever met would buy a fired stallion and most of the horses I had went abroad.

Mr. Hunting described firing as a prehistoric form of treatment. Mr. Fraser advises the firing of a sound leg on the ground that it makes it stronger: this seems an extraordinary statement. Again, he advises the castration of colts as they gain the advantage of the lighter body—my experience has been the exact opposite. A 2- or 3-year-old colt when castrated starts to grow and fill out, and becomes much heavier than if it had been left entire. A horse always grows bigger if castrated: look, for instance, at the very big 'chaser geldings and the enormous cart geldings, much bigger than any stallions. I have found that turning a horse with bowed legs out to grass is not attended with success: complete rest in a loose box is far better. I have known firing in a good many cases cause death from pneumonia—due to the pain, irritation and discomfort of being tied up—and in others death from blood poisoning, also from tetanus—and, again, several cases of horses breaking loose a day or two after being fired and biting and tearing their legs to such a degree that they had to be destroyed. There is nothing I know that decreases a horse's value so much as fired legs.

Yours faithfully,
R. C. Irving.

Shenley Lodge,
Ridge Hill,
Nr. Barnet, Herts.

* * * * *

ELECTRIC GOADS

To the Editor of the Veterinary Record

Sir,—With reference to letter of Mr. Edward Wilkinson in August 3rd issue of the *Veterinary Record*, a similar instrument to the "electric coaxer" mentioned is made in this country and somewhat extensively used. Several patterns are on the market; I think, however, that one known as the "Hot-Shot Prod" is probably the best. I have had several in the last few years and can endorse Mr. Wilkinson's opinion of their usefulness. The prod in question can be procured from Hot Shot Prod Company, 5222, Elliott Avenue, South Minneapolis, Minnesota, U.S.A. The price is, I believe, $4.95, which at present sub-normal rate of exchange would be about £1 10s. 0d.

Yours very truly,
Robert Boyd, D.V.M.

Mill Valley,
California.
September 3rd, 1940.

Advertisers' Announcements

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* * * * *

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DISEASES OF ANIMALS ACTS, 1894 to 1937, and AGRICULTURE ACT of 1937 (PART IV)

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th Sept., 1940	13	14	—	—	—	—	3	246	162
Corresponding period in ...									
1939	16	32	4	265	1	1	1	153	135
1938	19	22	2	169	—	—	4	52	39
1937	19	20	1	446	5	5	—	20	8
Total 1st January to 15 h Sept. 1940	280	438	24	3,665	15	30	129	3,266	2,276
Corresponding period in 1939	563	632	67	7,896	32	72	167	1,734	1,312
1938	599	659	162	20,633	42	72	120	495	381
1937	509	616	20	4,919	96	134	139	768	468

Note.—The figures for the current year are approximate only.

§ Excluding outbreaks in Army Horses.

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